MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2021/2022

PEM0044 – ESSENTIAL MATHEMATICS

(All sections / Groups)

5 OCTOBER 2022
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **FOUR (4) pages** including cover page with **4 Questions** only.

2. Answer all **FOUR (4)** questions

3. Only NON-PROGRAMMABLE calculators are allowed.

Question 1 (25 Marks)

a) Solve the following equation.

i. $\sqrt{x^2 - 3x + 64} = x + 5$ **(4 marks)**

ii. $\frac{3x-1}{x+4} + \frac{2x}{2x-5} = 4$ **(5 marks)**

iii. $3|2x - 3| - 4 = 8$ **(4 marks)**

iv. $3x^2 - 8x + 4 = 0$; by using quadratic formula **(5 marks)**

b) Solve the following inequality and express the answer using interval notation.

$$-15 \leq -2x - 3 \leq -11$$ **(4 marks)**

c) Simplify the expression and express the answer so that all exponents are positive.

$$\left(\frac{x^{-3}y^{8}}{x^{5}y^{11}}\right)^{-3}$$ **(3 marks)**

Question 2 (25 Marks)

a) Find the intercepts of a straight line that passes through points $(5,10)$ and $(-3,2)$.
Hence, graph the line. **(5 marks)**

b) Find the general linear equation that perpendicular to $y = 2x - 8$ and passes through point $(4,12)$. **(4 marks)**

c) Given the function $f(x) = x^2 + 7x - 60$. Find
i. the intercepts **(2 marks)**
ii. the vertex **(4 marks)**
iii. the axis of symmetry **(2 marks)**
iv. Hence, graph the function **(3 marks)**

d) Write an equation of a function that has the given characteristics.
$f(x) = x^2$: shifted 3 units upward and 2 units to left
Hence, graph the function by starting with basic function, $f(x) = x^2$. **(5 marks)**

Continued...

Question 3 (25 Marks)

a) Let $A = \begin{bmatrix} -4 & 6 & 7 \\ 3 & -5 & 12 \\ 7 & -11 & 14 \end{bmatrix}, B = \begin{bmatrix} 6 & -4 & 2 \\ 12 & -6 & -3 \\ 3 & 5 & 9 \end{bmatrix}$

i. $2A - 3B$ **(3 marks)**

ii. $A^T + B^T$ **(3 marks)**

iii. $A \cdot B$ **(4 marks)**

b) Solve the following system of linear equations using inverse of matrix.

$$\begin{aligned} -2x - 3y + z &= -20 \\ x + 4y - 2z &= 10 \\ 3x - y + z &= 26 \end{aligned}$$ **(15 marks)**

Question 4 (25 Marks)

a) Find the indicated term of the sequence.

i. The 24^{th} term of 30,25,20, ... **(2 marks)**

ii. The 8^{th} term of 4,16,64, ... **(2 marks)**

b) Given the 5th term and 10th term of a geometric sequence is 64 and 2048 respectively. Find the first term and common ratio of the sequence. **(4 marks)**

c) Differentiate the following function.

$$f(x) = \frac{3x^2 + 5x - 1}{x - 2}$$ **(6 marks)**

d) Integrate the following function:

i. $\int 3x^2(3x^3 + 4)^5 \, dx$ **(5 marks)**

ii. $\int_2^6 (3x^4 + 2x^2 + 5x + 6) dx$ **(6 marks)**

End of Questions.

Course: Essential Mathematics
Code: PEM0044

Summary of Formulas

Basic Rules of Differentiation

(i) $f'(c) = 0$
(ii) $f'(x) = nx^{n-1}$
(iii) $cf(x): cf'(x)$
(iv) $f(x) \pm g(x): f'(x) \pm g'(x)$
(v) Product rule, $f(x) = u.v: f'(x) = uv' + vu'$
(vi) Quotient rule, $f(x) = \frac{u}{v}; f'(x) = \frac{vu' - uv'}{v^2}$
(vii) Chain rule: $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
(viii) General power rule: Derive $[f(x)]^n = n[f(x)]^{n-1} f'(x)$

Basic Rules of Integration

(i) $\int k\,dx = kx + C$
(ii) $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$
(iii) $\int kf(x)\,dx = k\int f(x)dx$
(iv) $\int (f \pm g)(x) = \int f(x)dx \pm \int g(x)dx$

End of Page.